PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference PHUS030357WO	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/IB2004/052145	International filing date *(day/month/year)* 19 October 2004 (19.10.2004)	Priority date *(day/month/year)* 20 October 2003 (20.10.2003)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant KONINKLIJKE PHILIPS ELECTRONICS, N.V.		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 9 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☒	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☒	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 24 April 2006 (24.04.2006)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 740 14 35	Authorized officer Cecile Chatel Telephone No. +41 22 338 70 60

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/IB2004/052145	19.10.2004	20.10.2003

International Patent Classification (IPC) or both national classification and IPC
G03F7/20

Applicant
KONINKLIJKE PHILIPS ELECTRONICS, N.V.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☒ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

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WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/IB2004/052145

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

   a. type of material:

      ☐ a sequence listing

      ☐ table(s) related to the sequence listing

   b. format of material:

      ☐ in written format

      ☐ in computer readable form

   c. time of filing/furnishing:

      ☐ contained in the international application as filed.

      ☐ filed together with the international application in computer readable form.

      ☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application,

☒ claims Nos. 15

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination *(specify)*:

☐ the description, claims or drawings *(indicate particular elements below)* or said claims Nos. are so unclear that no meaningful opinion could be formed *(specify)*:

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☒ no international search report has been established for the whole application or for said claims Nos. 15

☐ the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:

the written form	☐	has not been furnished
	☐	does not comply with the standard
the computer readable form	☐	has not been furnished
	☐	does not comply with the standard

☐ the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions.

☐ See separate sheet for further details

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/IB2004/052145

Box No. IV Lack of unity of invention

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has:

   ☐ paid additional fees.

   ☐ paid additional fees under protest.

   ☒ not paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is

   ☐ complied with

   ☒ not complied with for the following reasons:

   see separate sheet

4. Consequently, this report has been established in respect of the following parts of the international application:

   ☐ all parts.

   ☒ the parts relating to claims Nos. 1-14

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-14
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-14
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-14
	No:	Claims	

2. Citations and explanations

   see separate sheet

RE SECTION IV

Claims 1-14 are directed to methods for determining the relative swing curve amplitudes for a plurality of wafer processes in which reflectances as a function of wavelength of different photoresist coated wafers are compared.

Claim 15 is directed to a plurality of wafers coated by different processes which have been exposed to actinic radiation.

In view of the prior art at hand US4308586 (Fig. 3) which discloses a plurality of substrates wafers coated with photoresist layers of different thickness (different processes) and whose reflectances are measured versus wavelength, the feature of claims 1-14 which could possibly represent an inventive contribution to the prior art is:

a) determining the relative swing amplitude for a plurality of processes from reflectance versus wavelength curve maxima and minima measurements.

Since this is however not a feature comprised in subject-matter directed to a plurality of wafers (claim 15) on which this step is performed, since this step does not have any affect on the wafers, there is no common inventive concept linking these sets of claims.

RE SECTION V

1. The present application relates to a method for determining the relative swing curve amplitudes for a plurality of wafer processes in which reflectance as a function of wavelength of different photo resist coated wafers are compared.

   The following documents are referred to:

   D1=US4308586; D2=EP0727715.

   The "swing curve" is the variation of a critical dimension such as line width as a

function of resist thickness - since the resist is not perfectly uniform across the substrate the same dose of radiation at the actinic wavelength will cause line width variations. The claimed methods are directed to comparing the relative merits of different processes for coating wafers with photo resist with regard to minimising the swing the curve (best critical dimension "CD" control) and to achieve this without requiring either the thickness variation of the resists across the sample surface or the developed line widths to be measured.

The object of the claimed invention is said to be achieved by effectively deducing the variation of critical dimension with respect to resist thickness variation from the measured variation of reflectance (at maximal and minimal excursions) with respect to wavelength in the vicinity of the actinic wavelength for various photo resist coating processes.

2. CLARITY AND INTERPRETATION OF CLAIMS

- " for providing different a top antireflective coating" - appears to be a typographical error (different implies a plurality of coatings) and broad enough that the antireflective coating is not necessarily present but rather only marginally limiting to the extent that the second photo resist is suitable for having such an AR coating provided thereon.

- although claim 1 is directed to determining relative swing curve amplitudes there is no step comprised in the method which is directed to determining such amplitudes. In this respect it is noted that determining a value "related to" CD (critical dimensions) encompasses a value of any parameter of the optical system (e.g. thickness, refractive index of layers, substrate).

- "first and second processes". This wording is sufficiently broad to encompass the processes being the same.

- "peak height, valley data" is broad enough to encompass e.g. the wavelengths corresponding to curve locations at maxima and minima and not necessarily the value of reflectance at these locations.

3. PRIOR ART

D1 (Fig. 3) discloses a plurality of substrates wafers coated with photo resist layers of different thickness (different processes) and whose reflectance are measured versus wavelength.

D2 (Figs. 3A-B) discloses three arrangements 15a, 20a and 30a of photo resist on a silicon substrate which produce respectively three reflectance spectra 15, 20 and 30 (Fig. 3B) which were obtained using the Nanometrics 4000 Series spectral reflectometer using ultraviolet light (UV) consisting of a plurality of wavelengths from about 200 to 800 nm (including actinic wavelength).

4. NOVELTY

Claims 1-14 meet the requirement of novelty (Art. 33.2 PCT) vis a vis the prior art in view of the feature:

a) determining the relative swing ratio for a plurality of processes from reflectance versus wavelength curve maxima and minima measurements.

Note:
With respect to claim 1, the final step of "determining a value relating to CD" should be amended to "determining relative swing curve amplitudes" for consistency with the title of the method in claim 1, lines 1-2.

5. INVENTIVE STEP

Re a):
Although several documents of the prior art, in particular D1, D2 do disclose measurement of the sinusoidal characteristic of reflectance versus wavelength for a plurality of wafers coated by different photo resist processes, none of them discloses or suggests that the peak and valley data of these characteristic can be used to deduce

relative swing curve amplitudes.

Claims 1-14 therefore meet the requirement of inventive step (Art. 33.3 PCT).